User manual M1

Current loop 4-20 mA

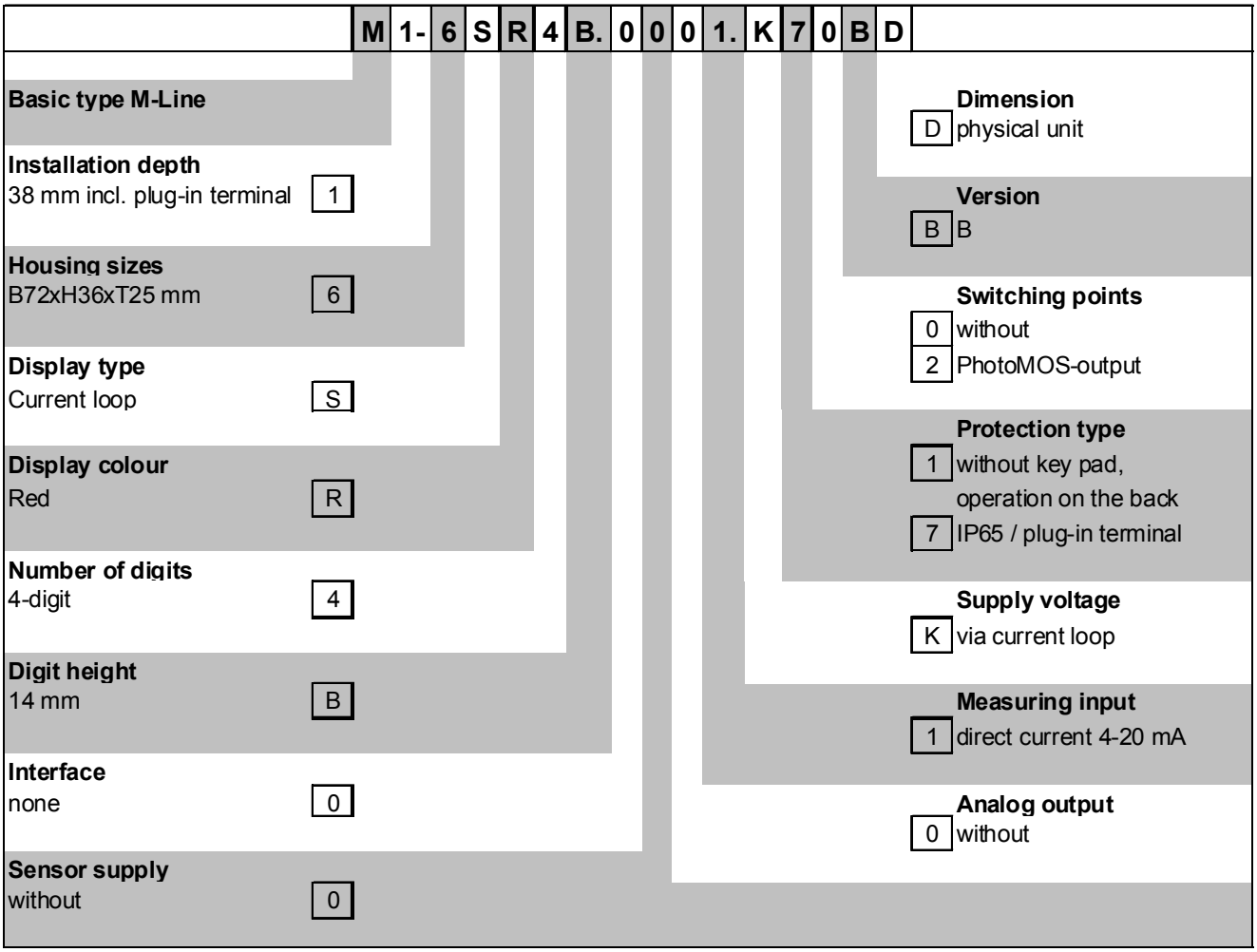
Technical features:

- red display of -1999…9999 digits
- minimal installation depth: 26 mm without plug-in terminal
- adjustment via factory default or directly on the sensor signal
- min/max-value recording
- 10 adjustable setpoints
- display flashing at threshold exeedance / undercut
- tara / offset value calibration
- programming interlock via access code
- protection class IP65 at the front
- plug-in terminal
- option: 2 galv. insulated switching outputs
- pc-based configuration kit PM-TOOL with CD & USB adapter for devices without keypad, for a simple adjustment of standard devices

Identification

STANDARD TYPES	ORDER NUMBERS
Current loop Housing sizes: 72x36 mm	**M1-6SR4B.0001.K70BD** **M1-6SR4B.0001.K72BD**

Options – breakdown of order code:



Please state physical unit by order, e.g. VA

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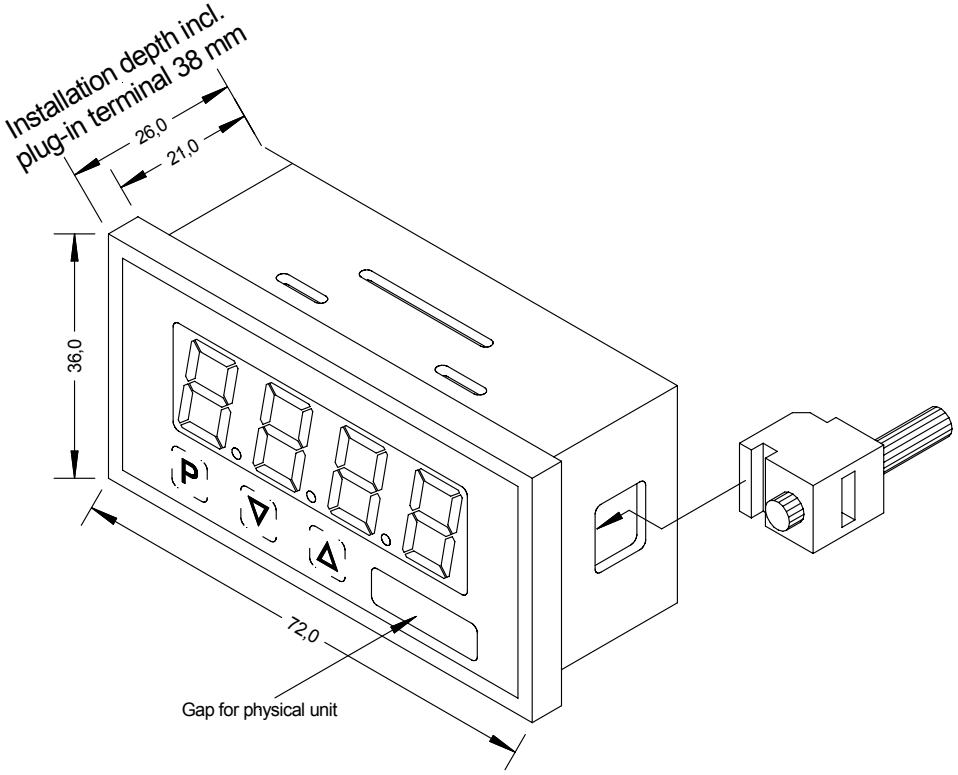
1. Assembly

Please read the *Safety instructions* on *page 14* before installation and keep this user manual for future reference.



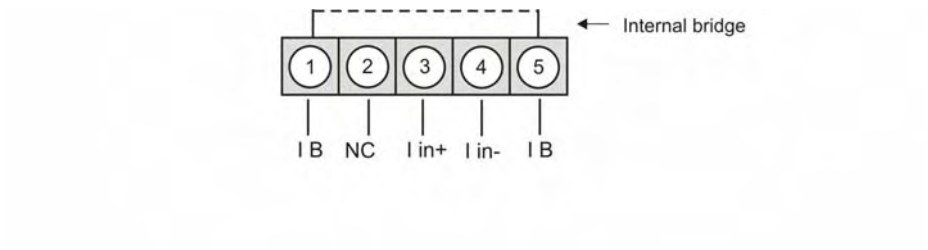
1. After removing the fixing elements, insert the device.
2. Check the seal to make sure it fits securely.
3. Click the fixing elements back into place and tighten the clamping screws by hand. Then use a screwdriver to tighten them another half a turn.

CAUTION! The torque should not exceed 0.1 Nm!

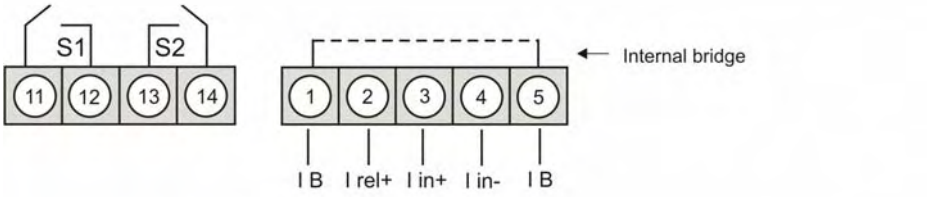
The dimension symbols can be exchanged before installation via a channel on the side!

2. Electrical connection

Typ M3-1S R4B.0001.K70BD – device without switching points



Typ M1-3S R4B.0001.K72BD – device with switching points

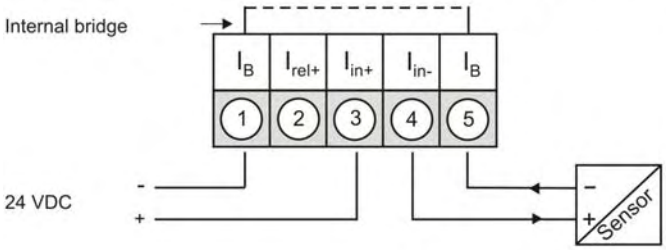


Switching outputs; for devices with switching outputs please use measuring input I rel+.

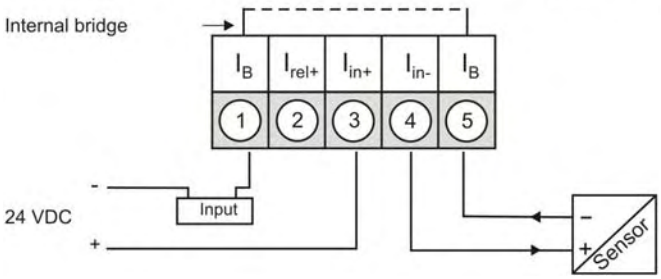
Connection examples:

Below you find some connection examples, which demonstrate some practical applications:

Current loop device in combination with a transmitter in current loop technique:

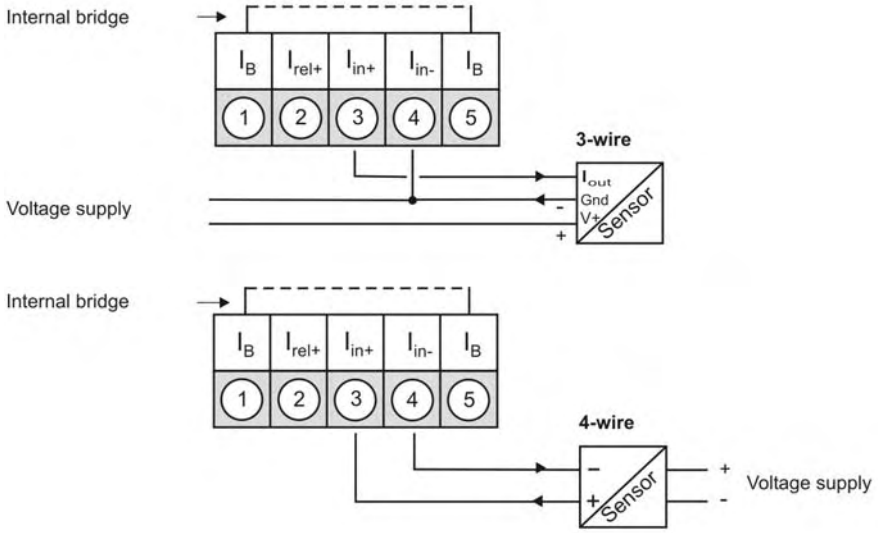


Current loop device in combination with another measuring input with low burden:

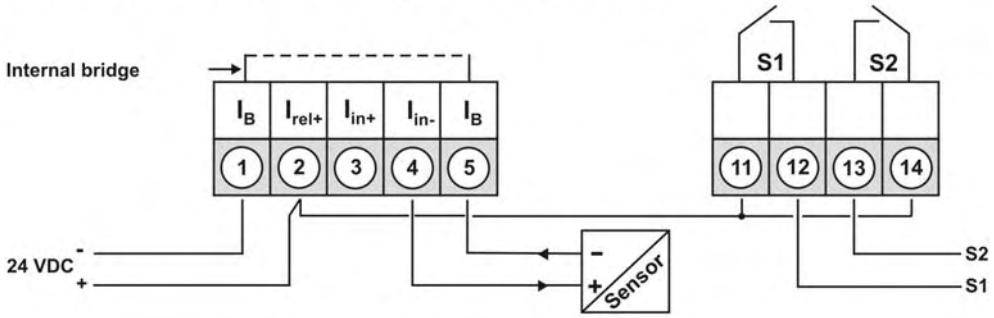


Connection examples

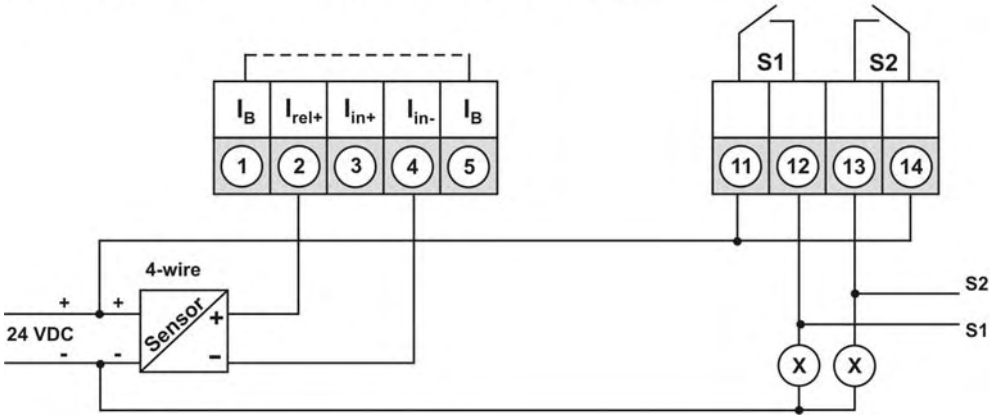
Current loop device in combination with a 3-/4-wire sensor:



Current loop device with switching outputs 24 VDC (up to 0.4 A):



Current loop device with a 4-wire sensor and switching outputs:



3. Function and operation description

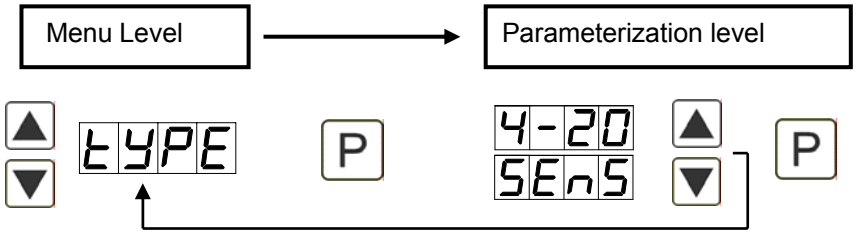
Operation
The operation is divided into two different levels.

Menu Level
Here it is possible to navigate between the individual menu items.

Parameterization level:
The parameters stored in the menu item can be parameterized here.
Functions that can be adjusted or changed are always indicated with a flashing of the display. Adjustments made at the parameterization level should be always confirmed by pressing the **[P]** key to save them.
However, the display automatically saves all adjustments and then switches to operation mode if no further keys are pressed within 10 seconds.

Level	Button	Description
Menu level	P	Change to parameterization level with the relevant parameters
	▲ ▼	For navigation at the menu level
Parameterization level	P	To confirm the changes made at the parameterization level
	▲ ▼	To change the value or setting

Example:



Programming via configuration software PM-TOOL-MUSB6

You receive the software on CD incl. an USB-cable with a device adaptor. The connection is done via a 6-pole micromatch connector plug on the back and the PC is connected via an USB connector plug.

System requirements: PC with USB interface

Software: Windows XP, Windows Vista

4. Setting up the device

4.1. Switching on

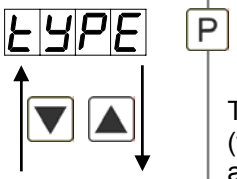
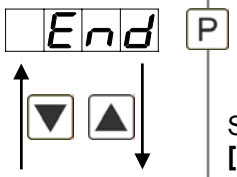
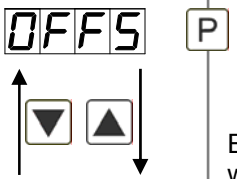
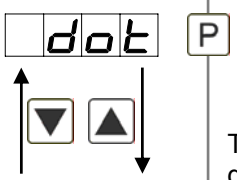
Once the installation is complete, you can start the device by applying the current loop. Beforehand check once again that all the electrical connections are correct.

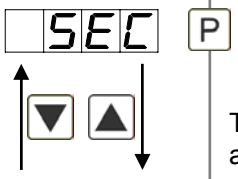
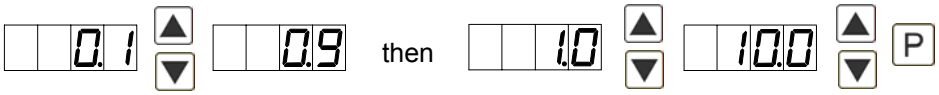
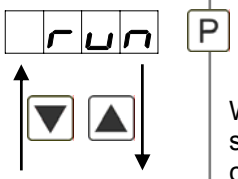
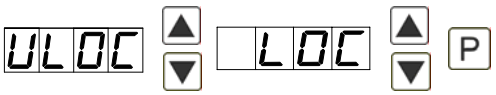
Starting sequence

For 1 second during the switching-on process, the segment test (*8 8 8 8*) is displayed, followed by an indication of the software type and, after that, also for 1 second, the software version. After the start-up sequence, the device switches to operation/display mode.

4.2. Standard parameterization:

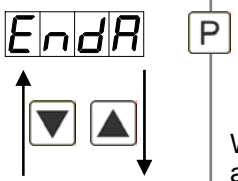
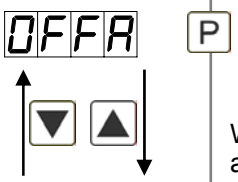
To be able to parameterize the display, press the **[P]** key in operating mode for 1 second. The display then changes to the menu level with the first menu item *TYPE*.

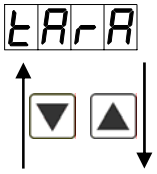
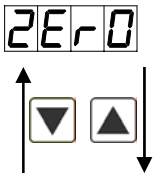
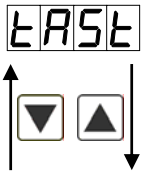
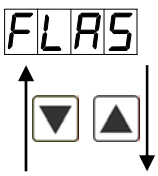
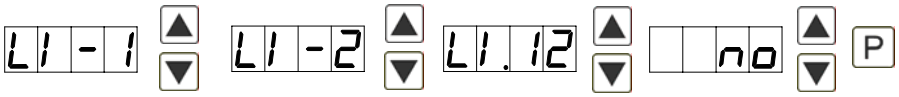
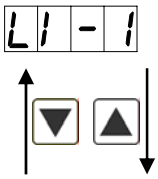
Menu level	Parameterization level
	**Selection of the input signal,** *TYPE:* Default: *SENS* There are two measuring input options for the current loop: *4-20* **mA** as the works calibration (without application of the sensor signal) and *SENS* as the sensor calibration (with the sensor applied). Confirm the selection with **[P]** and the display switches back to the menu level.
	**Setting the measuring range end value,** *END*: Default: *2000* Set the end value from the smallest to the highest digit with [▲] [▼] and confirm each digit with **[P]**. A minus sign can only be parameterized on the highest value digit. After the last digit, the display switches back to the menu level. If *SENS* was selected as the input option, you can only select between *NOCA* and *CAL*. With *NOCA*, only the previously set display value is taken over, and with *CAL*, the device takes over both the display value and the analogue input value.
	**Setting the measuring range start/offset value,** *OFFS*: Default: *0400* Enter the start/offset value from the smallest to the highest digit [▲] [▼] and confirm each digit with **[P]**. After the last digit the display switches back to the menu level. If *SENS* was selected as the input option, you can only select between *NOCA* and *CAL*. With *NOCA*, only the previously set display value is taken over, and with *CAL*, the device takes over both the display value and the analogue input value.
	**Setting the decimal point,** *DOT*: Default: *0* The decimal point on the display can be moved with [▲] [▼] and confirmed with **[P]**. The display then switches back to the menu level again.

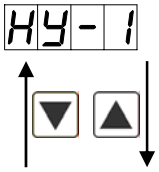
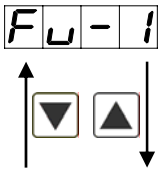
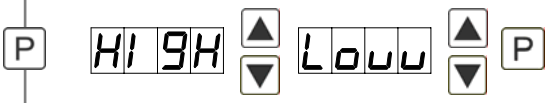
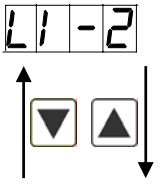
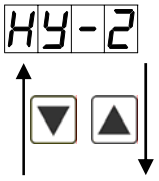
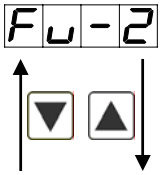
Menu level	Parameterization level
	**Setting the display time, *SEC*:** Default: *01.0*  The display time is set with [▲] [▼]. The display moves up in increments of 0.1 up to 1 second and in increments of 1.0 to 10.0 seconds. Confirm the selection by pressing the **[P]** button. The display then switches back to the menu level again.
	**Activation / deactivation of the programming lock and completion of the standard parameterization, *RUN*:** Default: *ULOC*  With the aid of the [▲] [▼] keys, you can choose between the deactivated key lock *ULOC* (works setting) and the activated key lock *LOC*. Make the selection with **[P]**. After this, the display confirms the settings with **"- - - -"**, and automatically switches to operating mode. If *LOC* was selected, the keyboard is locked. To get back into the menu level, you must press **[P]** for 3 seconds in operating mode. You must now enter the *CODE* (works setting *1 2 3 4*) that appears using the [▲] [▼] keys plus **[P]** to unlock the keyboard. *FAIL* appears if the input is wrong.

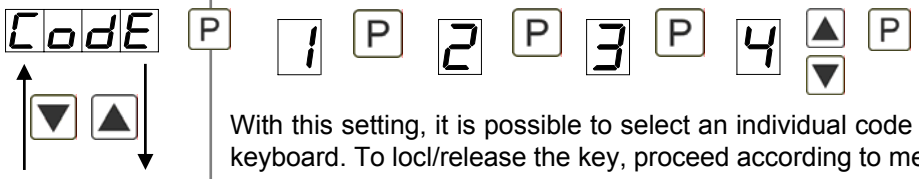
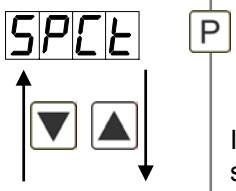
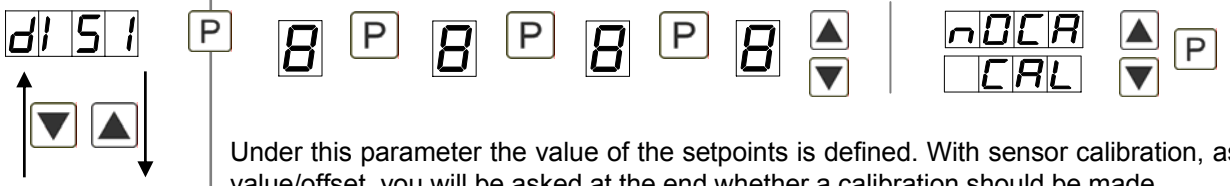
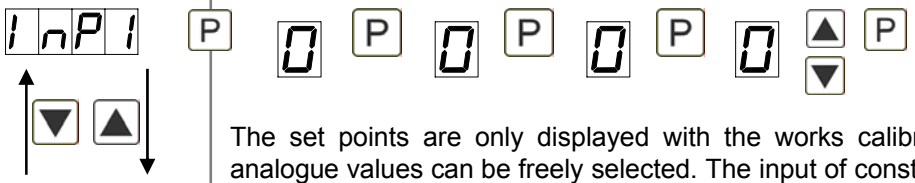
4.3. Extended parameterization

By pressing the [▲] & [▼] buttons during standard parameterization for one second, the display switches to the extended parameterization mode.
The operation is the same as in standard parameterization.

Menu level	Parameterization level
	**Rescaling the measuring input values, *ENDA*:** Default: *20.00* With the aid of this function, you can rescale the input value of **4-20 mA** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.
	**Rescaling the measuring input values, *OFFA*:** Default: *4* With the aid of this function, you can rescale the input value of **4-20 mA** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.

Menu level	Parameterization level
	**Setting the tare /offset value,** *TARA:* Default: *0* The given value is added to the linerarized value. In this way, the characteristic line can be shifted by the selected amount.
	**Zero point slowdown,** *ZERO:* Default: *0* With zero point slowdown, a value range around zero can be preselected at which the display shows zero. If, for example, a 10 is set, the display would show a zero in the range from -10 to +10 and continue below it with -11 and above it with +11.
	**4.3.1. MIN/MAX value inquiry - Assignment of key functions,** *TAST:* Default: *NO* Here, you can enter for the operating mode either a min/max-value inquiry or a threshold value correction on the arrow keys. If the min/max-memory is activated with *EHER*, the measured min/max-values will be saved during operation and can be called up via the arrow keys **[▲] [▼].** The values are lost if the device is restarted. If the threshold value correction *LI.1* is selected, the limit values can be changed during operation without hindering the operating procedure. With *TARA* the display is tared to zero and is saved permanently as offset. The device confirms the correct taring by showing *0000* in the display. If *NO* is parameterized, the navigation keys **[▼] [▲]** have no function in operating mode.
	**4.3.2. Flashing of display,** *FLAS:* Default: *NO*  Here, flashing of the display can be added as an extra alarm function, either to the first limit value (select: *LI-1*), the second limit value (select: *LI-2*) or to both limit values (select: *LI-12*). With *NO* (works setting), no flashing is assigned at all.
	**4.3.3. Limit values / Limits,** *LI-1:* Default: *0800* For both limit values, two different values can be parameterized. With this, the parameters for each limit value are called up one after the other.

Menu level	Parameterization level
	**Hysteresis for limit values,** *HY-1:* Default: *0000* For both limit values, a hysteresis function exists that reacts according to the functional principle (operating current / quiescent current).
	**Function if display falls below / exceeds limit value,** *FU-1:* Default: *HIGH*  The limit value undercut can be selected with *LOUU* (LOW = lower limit value) and limit value exceedance can be selected with *HIGH* (HIGH = upper limit value). If e.g. limit value 1 is on a switching threshold of 100 and occupied with function *HIGH*, the alarm will be activated by reaching the threshold. If the limit value is allocated to *LOW*, an alarm will be activated by undercut of the threshold.
	**Limit value /Limits,** *LI-2:* Default: *1200* For both limit values, two different values can be parameterized. With this, the parameters for each limit value are called up one after the other.
	**Hysteresis for limit values,** *HY-2:* Default: *0000* For both limit values, a hysteresis function exists that reacts according to the functional principle (operating current / quiescent current).
	**Function if display falls below / exceeds limit value,** *FU-2:* Default: *HIGH* The limit value undercut can be selected with *LOUU* (LOW = lower limit value) and limit value exceedance can be selected with *HIGH* (HIGH = upper limit value). If e.g. limit value 1 is on a switching threshold of 100 and occupied with function *HIGH*, the alarm will be activated by reaching the threshold. If the limit value is allocated to *LOW*, an alarm will be activated by undercut of the threshold.

Menu Level	Parameterization level
	Setting the code, *CODE:* Default: *1234*  With this setting, it is possible to select an individual code (works setting *1 2 3 4*) for locking the keyboard. To locl/release the key, proceed according to menu item *RUN*.
	**4.3.4. Set points - Number of additional set points,** *SPCT:* Default: *0* In addition to the start and end value, 8 extra set points can be defined to linearize non-linear sensor values. Only the activated set point parameters are displayed.
	Display values for setpoints, *DIS1 ... DIS8:*  Under this parameter the value of the setpoints is defined. With sensor calibration, as with end value/offset, you will be asked at the end whether a calibration should be made.
	Analogue values for setpoints, *INP1 ... INP8:*  The set points are only displayed with the works calibration (**4-20 mA**) Here, the desired analogue values can be freely selected. The input of constantly rising analogue values must be carried out by the customer/user.

4.4. Reset to default values

To return the unit to a **defined basic state**, a reset can be carried out to the default values.

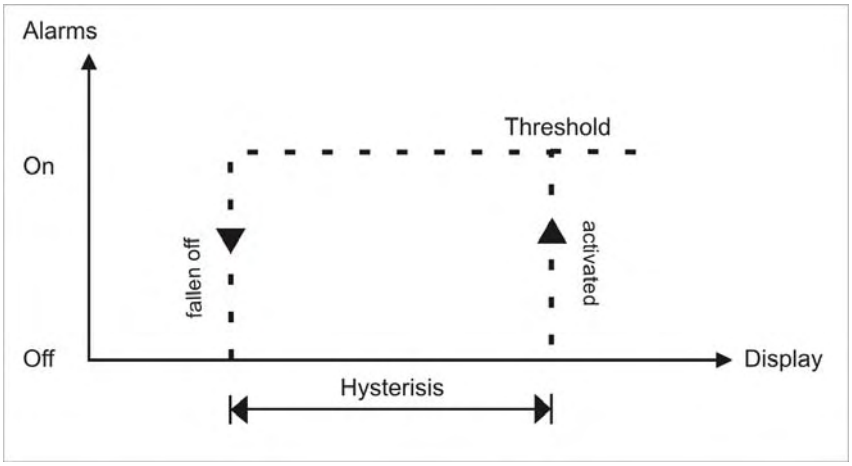
The following procedure should be used:

- Switch off the power supply
- Press button [**P**]
- Switch on loop current (approx. 3.8 mA) and press **[P]-**button until „- - - -" is shown in the display.

With reset, the default values of the program table are loaded and used for subsequent operation. This puts the unit back to the state in which it was supplied.

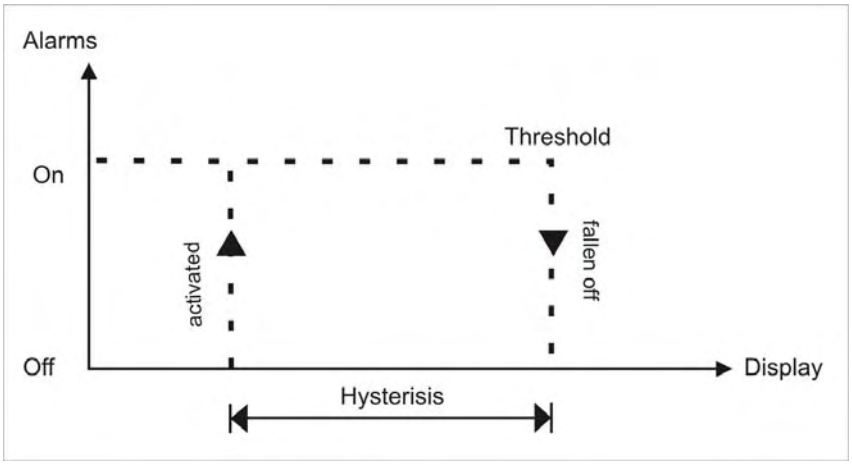
Caution! All application-related data are lost.

Functional principle of the setpoints



Limit value exceedance "HIGH"

By limit value exceedance the alarm S1-S2 is off below the threshold and on on reaching the threshold.



Limit value undercut "LOW"

By limit value undercut the alarm S1-S2 is on below the threshold and switched off on reaching the threshold.

Alarms / optical setpoint display

An activated set point can be optically indicated by flashing of the 7-segment display.

Functional principle of the alarms	
Alarm	Deactivated, display value
Threshold	Threshold/limit value for switch over
Hysteresis	Width of the window between the thresholds
Operating principle	Operating current / quiescent current

5. Technical data

Housing			
Dimensions			
72x36	72x36x26 mm (BxHxD)		
	72x36x38 mm (BxHxD) including plug-in terminal		
Panel cut-out			
72x36	$68.0^{+0,7}$ x $33.0^{+0.6}$ mm		
Insulation thickness	up to 3 mm		
Fixing	snap-in screw element		
Material	PC Polycarbonat, black		
Sealing material	EPDM, 65 Shore, black		
Protection class	standard IP65 (front), IP00 (back side)		
Weight	approx. 100 g		
Connection	plug-in terminal; wire cross section up to 2.5 mm^2		
Display			
Digit height	14 mm		
Segment colour	red		
Display range	-1999 to 9999		
Setpoints	optical display flashing		
Overflow	horizontal bars at the top		
Underflow	horizontal bars at the bottom		
Display time	0.1 to 10.0 seconds		
Input	**Measuring range**	**Measuring fault**	**Digit**
min. 3.5…max. 21 mA	4 – 20 mA	0.3 %	±1
Fail of voltage	approx. 5.1 V without switching outputs approx. 8.0 V with switching outputs		
Measuring range / Input resistance / Measuring fault at measuring time = 1 second			
Temperature drift	100 ppm / K		
Measuring time	0.1…10.0 seconds		
Measuring principle	successive approximation		
Resolution	12 Bit-converter 14 Bit (noiseless by oversampling at 1s measuring time)		

Output	
Setpoints	Potential free PhotoMos-Outputs max. switching voltage 30 VDC/AC max. steady current 0.4 A Electric strength AC: 400 V permanent, 1800 V for 1 min
Memory	Flash-memory (independent of supply)
Data life	≥ 100 years
Ambient conditions	
Working temperature	0…60°C
Storing temperature	-20…80°C
Climatic density	relative humidity 0-80% on years average without dew
EMV	EN 61326
CE-sign	Conformity to directive 2004/108/EG
Safety standard	according to low voltage directive 2006/95/EG EN 61010; En 60664-1

6. Error elimination

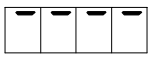
Below please find the recommended procedure for dealing with faults and locating their possible cause.

6.1. Questions and answers

I. The display of the device is dark

- Check the current loop current of the device
- Please contact the manufacturer if errors of this kind occur

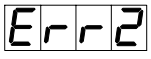
II. The device shows



Displayed overflow at exceedance of display/measuring range

Displayed overflow at undershooting of display/measuring range

III. The device shows



Loop current < 3,5 mA

7. Safety advice

Please read the following safety advice and the assembly *chapter 1* before installation and keep it for future reference.

Proper use

The **M1-6S-device** is designed for the evaluation and display of current loop signals. With the switching points, it is possible to perform simple control tasks (only possible for devices with switching points).

Danger! Careless use or improper operation can result in personal injury and/or damage to the equipment.

Control of the device

The panel meters are checked before dispatch and sent out in perfect condition. Should there be any visible damage, we recommend close examination of the packaging. Please inform the supplier immediately of any damage.

Installation

The **M1-6S-device** must be installed by a suitably **qualified specialist** (e.g. with a qualification in industrial electronics).

Notes on installation

- There must be no magnetic or electric fields in the vicinity of the device, e.g. due to transformers, mobile phones or electrostatic discharge.
- Do not install **inductive consumers** (relays, solenoid valves etc.) near the device and **suppress** any interference with the aid of RC spark extinguishing combinations or free-wheeling diodes.
- Keep input, output and supply lines separate from one another and do not lay them parallel with each other. Position “go” and “return lines” next to one another. Where possible use twisted pair. So, you receive best measuring results.
- Screen off and twist sensor lines. Do not lay current-carrying lines in the vicinity. Connect the **screening on one side** on a suitable potential equaliser (normally signal ground).
- The device is not suitable for installation in areas where there is a risk of explosion.
- Any electrical connection deviating from the connection diagram can endanger human life and/or can destroy the equipment.
- The terminal area of the devices is part of the service. Here electrostatic discharge needs to be avoided. Attention! High voltages can cause dangerous body currents.
- Galvanic insulated potentials within one complex need to be placed on an appropriate point (normally earth or machines ground). So, a lower disturbance sensibility against impacted energy can be reached and dangerous potentials, that can occur on long lines or due to faulty wiring, can be avoided.